

## Amendments to the Claims:

1-51. (Cancelled).

52. (Currently amended) A method of processing lignocellulose-containing material from xylan-containing biomass comprising pentoses and hexoses to produce ethanol and xylitol, comprising the steps of:

partially hydrolyzing lignocellulose-containing material in xylan-containing matter in biomass comprising pentoses and hexoses to produce a partially hydrolyzed solution comprising an extracted biomass and solubles; the solubles comprising free pentoses, hexoses, pentosans, hexosans and residue; and the extracted biomass comprising hexosans, pentosans and solids;

said lignocellulose-containing material comprising at least one lignocellulosic material selected from the group consisting of cellulose and hemicellulose;

said pentoses comprising at least one pentose-containing material selected from the group consisting of xylose and arabinose;

said hexoses comprising at least one hexose-containing material selected from the group consisting of glucose, galactose, rhamnose and mannose;

said xylan-containing matter selected from the group consisting of wood, hardwood, softwood, plants, plant constituents, grains, particulates of grain, stems, shells, corn cobs, cornstraw, corn fiber, nutshells, almond shells, coconut shells, bagasse, cotton seed bran, cotton seed skins, wood chips, sawdust, woodpulp, processed paper, spent sulphite liquor, spent liquor from hardwood pulping, spent liquor from paper processing, spent liquor from woodpulp processing, sulphite cooking liquor, and liquids derived from wood, hardwood, softwood, plants, plant constituents, grains, particulates of grain, stems, shells, corn cobs, cornstraw, corn fiber, nutshells, almond shells, coconut shells, bagasse, cotton seed bran, cotton seed skins, wood chips, sawdust, woodpulp, and processed paper;

separating said partially hydrolyzed solution into an extracted biomass and solubles; said extracted biomass comprising pentosans, hexosans, and solids, said solubles comprising xylose, hexoses, soluble xylans, pentoses, soluble pentosans and hexosans, and residue;

hydrolyzing said extracted biomass to produce a hydrolyzed biomass comprising hexoses, pentoses, and hydrolyzed solids, said hydrolyzing converting a

substantial amount of said pentosans to pentoses, and said hydrolyzing converting a substantial amount of said hexosans to hexoses;

separating said hydrolyzed biomass into a biomass solution and solids, said biomass-solution comprising pentoses and hexoses, said biomass solution comprising a greater concentration of pentoses by weight on a dry substance (solids) basis than said pentoses in said hydrolyzed biomass, said biomass solution comprising a greater concentration of hexoses by weight on a dry substance (solids) basis than said hexoses in said hydrolyzed biomass;

fractionating said solubles to separate said solubles into fractions comprising a xylose-rich fraction, a xylose-containing fraction, and a residue fraction, said xylose-rich fraction comprising a higher concentration of xylose by weight on a dry substance (solids) than said xyloses in said solubles, said residue fraction comprising a higher concentration of residue by weight on a dry substance (solids) than said residue in said solubles, said xylose-rich fraction comprising a higher concentration of at least one compound by weight on a dry substance (solids) than said compound in said other fractions, and said compound being selected from the group consisting of xylose, arabinose, mannose, galactose and rhamnose;

hydrogenating said xylose-rich fraction to produce hydrogenated xylitol, said hydrogenated xylitol having a greater concentration of xylitol by weight on a dry substance (solids) basis than said xylitols in said solubles;

fermenting said xylose-containing fraction and said biomass solution with microbes to produce a fermented solution comprising fermented ethanol and spent microbes, said fermenting comprising converting a substantial amount of said xyloses in said xylose-containing fraction to fermented ethanol and part to xylitol and fermenting a substantial amount of said pentoses and hexoses in said biomass solution to fermented ethanol; and

said microbes comprising at least one fermenting microorganism selected from the group consisting of naturally occurring bacteria, recombinant bacteria, naturally occurring yeast, recombinant yeast, and fungi.

53. (Original) A method according to Claim 52 including crystallizing said xylitol to produce crystalline xylitol.

54. (Original) A method according to Claim 52 wherein said xylitol comprises liquid xylitol.

55. (Previously presented) A method according to Claim 52 including separating a substantial portion of the spent microbes from the fermented solution to produce a fermented liquid derived from said fermented solution, said fermented liquid comprising fermented ethanol and spent microbes; said fermented liquid comprising substantially less spent microbes by weight on a dry substance (solids) basis than said spent microbes in said fermented solution; and distilling said fermented liquid derived from said fermented solution to produce a distilled solution comprising distilled ethanol, said distilled ethanol comprising a greater concentration of ethanol by weight on a liquid basis than said fermented ethanol in said fermented solution.

56. (Previously presented) A method according to Claim 55 wherein  
said separating of said substantial portion of said spent microbes from said fermented solution comprises at least one separating method selected from the group consisting of filtration, centrifugation, decanting, flocculation and flotation.

57. (Previously presented) A method according to Claim 52 wherein separating of said hydrolyzed biomass includes at least one separation method selected from the group consisting of filtration of said hydrolyzed biomass, membrane filtration of said hydrolyzed biomass, ultrafiltration of said hydrolyzed biomass, nanofiltration of said hydrolyzed biomass, microfiltration of said hydrolyzed biomass, centrifugation of said hydrolyzed biomass, decanting of said hydrolyzed biomass, clarification of said hydrolyzed biomass, crystallization of said hydrolyzed biomass, chromatography, ion exclusion, ion-exchange of said hydrolyzed biomass, concentration of said hydrolyzed biomass, evaporation of said hydrolyzed biomass, reverse osmosis of said hydrolyzed biomass, color removal of said hydrolyzed biomass, and detoxification of said hydrolyzed biomass.

58. (Previously presented) A method according to Claim 52 wherein said separated biomass solution is detoxified to help remove inhibitors prior to fermenting with one or more of the following: liming, calcium hydroxide or calcium oxide addition, hydroxide addition, pH adjustment, activated charcoal treatment, extraction with organic solvents, ion exchange, ion exclusion, molecular sieve treatment, steam stripping, heating, removing furfural,

stripping volatile compounds, and reduction of said separated biomass solution by sulphite addition.

59. (Previously presented) A method according to Claim 52 wherein said xylose-containing fraction is detoxified to help remove inhibitors prior to fermenting by one or more of the following: liming, calcium hydroxide or calcium oxide addition, hydroxide addition, pH adjustment, concentration, filtering, activated charcoal treatment, extraction with organic solvents, ion exchange, ion exclusion, molecular sieve treatment, steam stripping, heating, removing furfural, stripping volatile compounds, and reduction of said xylose-containing fraction by sulphite addition.

60. (Original) A method according to Claim 52 including combusting at least some of said solids in said extracted biomass prior to hydrolyzing said extracted biomass.

61. (Previously presented) A method according to Claim 52 wherein:  
said fractionating comprises chromatographic separation; wherein  
said chromatographic separation is selected from the group consisting of batch separation, continuous simulated moving bed separation, and sequential simulated moving bed separation.

62. (Previously presented) A method according to Claim 52 wherein:  
said fractionating comprising filtering; wherein  
said filtering is selected from the group consisting of membrane filtration, ultrafiltration, nanofiltration, and microfiltration.

63. (Original) A method according to Claim 62 wherein:  
said filtering comprises passing a solution comprising said solubles through at least one membrane; and  
said membrane is selected from the group consisting of a high shear membrane, a vibrating membrane, a rotating membrane, a flat sheet membrane, a tubular membrane, a spiral membrane, a hollow fiber membrane, a neutral charged membrane, an ionic membrane, a cationic membrane, and an anionic membrane.

64. (Original) A method according to Claim 52 wherein said hydrogenating comprises chemical hydrogenation.
65. (Original) A method according to Claim 52 wherein said hydrogenating comprises biochemical hydrogenation.
66. (Original) A method according to Claim 52 further comprising crystallizing said hydrogenated fraction to produce xylitol crystals.
67. (Previously presented) A method according to Claim 66 wherein said crystallization is cooling crystallization.
68. (Original) A method according to Claim 66 wherein said xylitol crystals are separated by centrifugation or filtration and washed with water to produce substantially pure crystalline xylitol.
69. (Previously presented) A method according to Claim 52 wherein said hydrolyzing of said extracted biomass is selected from the group consisting of enzymatic hydrolysis of said extracted biomass with enzymes having a cellulolytic and xylanolytic activity to hydrolyze said extracted biomass, and acid hydrolysis of said extracted biomass.
70. (Original) A method according to Claim 52 wherein said partially hydrolyzing of said lignocellulose-containing material is selected from the group consisting of steam explosion of said lignocellulose-containing material, partial enzymatic hydrolysis of said lignocellulose-containing material with enzymes having a cellulolytic and xylanolytic activity to partially hydrolyze said-lignocellulose-containing material, partial acid hydrolysis of said lignocellulose-containing material, and subjecting said lignocellulose-containing material to acetic acid.
71. (Previously presented) A method according to Claim 52 wherein said partially hydrolyzed solution is separated by at least one separation method selected from the group consisting of: centrifugation of said partially hydrolyzed solution, decanting of said partially

hydrolyzed solution, clarification of said partially hydrolyzed solution, crystallization of said partially hydrolyzed solution, precipitation, chromatography of said partially hydrolyzed solution, ion-exchange, concentration of said partially hydrolyzed solution, evaporation of said partially hydrolyzed solution, reverse osmosis of said partially hydrolyzed solution, filtration of said partially hydrolyzed solution, membrane filtration of said partially hydrolyzed solution, ultrafiltration of said partially hydrolyzed solution, nanofiltration of said partially hydrolyzed solution, and microfiltration of said partially hydrolyzed solution.

72. (Previously presented) A method according to Claim 52 wherein prior to the partial hydrolyzing of the lignocellulose-containing material in xylan-containing matter in biomass, biomass hydrolysates are obtained by direct acid hydrolysis of the biomass, prehydrolysis of the biomass with steam or acetic acid, acid hydrolysis of prehydrolysate obtained by prehydrolysis of the biomass with steam or acetic acid or a sulphite pulping process, such that said partially hydrolyzed solution comprises biomass hydrolysates.

73. (Previously presented) A method according to Claim 72 wherein said biomass hydrolysates are selected from the group consisting of: spent sulphite pulping liquor, acid spent sulphite liquor, spent liquor from softwood pulping before hexoses are removed, spent liquor from softwood pulping after hexoses are removed, spent liquor from hardwood pulping, spent liquor from digestion of said biomass, spent liquor from hydrolysis of said biomass, spent liquor from solvent-based pulping, spent liquor from phenol based pulping, spent liquor from formic acid based pulping, spent liquor from ethanol-based pulping, mother liquor from crystallization of xylose, and diluted runoff of xylitol crystallization of sulphite spent pulping liquor based fraction.

74. (Previously presented) A method according to Claim 52 wherein:  
said pentoses in said biomass solution comprises arabinose; and  
said arabinose is reduced to arabinitol during fermentation.

75. (Canceled)

76. (Original) A method according to Claim 52 wherein said fermenting microorganism is a yeast selected from the group consisting of a yeast of the genera *Candida*, *Pichia*, *Pachysolen*, or *Debaryomyces*.

77. (Previously presented) A method according to Claim 76 wherein said yeast is selected from the group consisting of *Candida shehatae* CBS 2779 (ATCC 60778), *Candida tropicalis* ATCC 9968, and *Pachysolen tannophilus* NRRL Y-2460 (ATCC 32691).

78. (Original) A method according to Claim 77 wherein said fermenting occurs at a temperature ranging from about 10 to about 45 degrees C at a pH ranging from 4 to 7 with a yeast concentration of about 1 to about 40 g of dry yeast per liter of solution comprising said xylose-containing fraction and said separated biomass solution, for about 24 to about 96 hours in the presence of at least one nutrient.

79. (Original) A method according to Claim 78 wherein said nutrient is selected from the group consisting of yeast extract, diammoniumphosphate, peptone, biotin, thiamin, folic acid, a water soluble vitamin, a fat soluble vitamin, vitamin A, vitamin B complex, vitamin D, vitamin E, vitamin K, vitamin B1, vitamin B2, vitamin B5, vitamin B6, vitamin B12, vitamin B 15, and a vitamin.

80. (Previously presented) A method according to Claim 52, wherein the hardwood is selected from the group consisting of alder, aspen, birch, beech, eucalyptus, poplar, willow and maple; wherein the softwood is selected from the group consisting of pine and spruce, and willow; wherein the grains are selected from the group consisting of wheat, barley, rye, rice and oat; and wherein the particulates of grain are selected from the group consisting of straw, hulls, husks and fiber.